July 20, 2006

Department Of Fire Services, Massachusetts
Board of Fire Prevention Regulations
PO Box 1025, State Road,
Stow, MA 01775

By E-Mail To: Timothee Rodrique, DFS & David Demers, Chairman, 527CMR

Dear Board:

I would like to ask that the Board consider the following changes to 527CMR. (See strike-through and underlined sentence.)

24.03: Definitions

Automatic Smoke Detector. A device which automatically detects ~~the visible or invisible~~ particles of combustion and automatically initiates an audible alarm that can be effectively heard above the maximum noise level obtained under normal conditions of occupancy. Effective, January 1, 2008, for the purposes of 527CMR Section 24 a smoke detector that only operates on the ionization principle shall not be considered a smoke detector.

24.06: Equipment Performance

(1) Smoke Detectors.

(a) Each smoke detector shall detect abnormal quantities of smoke that may occur in a building and shall properly operate in the normal environmental conditions of said building.

(b) All smoke detectors used pursuant to the provisions of 527 CMR 24.00 shall be listed to UL 268 or UL 217. Effective, January 1, 2008, for the purposes of 527CMR Section 24 a smoke detector that only operates on the ionization principle shall not be considered a smoke detector.

Comment

This additional language is needed because ionization *detectors do not reliably detect "abnormal quantities of smoke that may occur in a building"*. (See Section 24.06 (1).) In addition, I would suggest that the Board delete the language "visible or invisible" from section 24.03. The only invisible particles of combustion that may cause a hazard are CO gas particles. These can be detected by the CO Detectors now required in Massachusetts. (In addition, it is due to the ionization detector's sensitivity to invisible particles that they are so susceptible to nuisance alarms.)

This would mean that all smoke detectors would have to be photoelectric or a combination device that included both photoelectric and ionization elements. This does not restrict the sale of ionization smoke detectors, although the Board may end up believing that such language may assist in the enforcement of this type of regulation. However, I would like to point out that the Board has regulated other items in such a manner that their use is allowed but restricted (See Section 29.03)

> *29.03: Requirements for Upholstered Furniture and Molded Seating*
>
> *(1) On and after May 1, 1994, all regulated seating sold for use in the Commonwealth of Massachusetts, except as provided in 527 CMR 29.03(4), shall meet the test criteria set forth in the State of California, Bureau of Home Furnishings and Thermal Insulation Technical Bulletin Number 133, entitled "Flammability Test Procedure For Seating Furniture For Use In Public Occupancies," dated January 1991, or tested in accordance with ASTM E 1537-93, "Standard Test Method for Fire Testing of Real Scale Upholstered Furniture Items," and meeting the test criteria of California Technical Bulletin 133.*

According to this language, furniture, which does not meet this standard, can be sold in Massachusetts, but it cannot be used in certain regulated occupancies. In a similar fashion, I am asking the Board to restrict the use of ion –only detectors after a certain date; I am suggesting January 1, 2008, in occupancies regulated by Section 24.

Another precedent that I would like the Board to consider is the recent requirements for CO Detectors that the Board approved.

If I am correct, then the fact that, the ionization detector cannot safely detect smoldering smoke, may be responsible for 30% of all fire fatalities nationwide. In addition to this, the fact that the ionization detector is so susceptible to nuisance alarms contributes to another 20% of the fire fatalities nationwide. These nationwide percentages are similar to the percentages in Massachusetts. As a consequence, it is not unreasonable to assume that if only ½ of the potential benefit is achieved then requiring all detectors to have a photoelectric, sensor could reduce deaths by 25%. (From 2002-2004 this would have averaged 10-12 lives saved per year.

This benefit, in terms of lived saved, compares very favorably with the benefit that was hoped to be achieved by the Board's mandating of CO technology in homes. (In fact, the benefit could be 5-10 times greater.) In addition, since the incremental cost difference between an ionization detector and a photoelectric detector is much less than the cost of a CO detector the benefit could be achieved <u>at lower cost to the consumer</u>. (I would like to point out that the cost differential, between ion and photos, that exists at retail stores may be illusory.) In a retail environment, a typical ion may sell for 7-10$ while a typical photo may sell for anywhere from $15 to $25. The BFD which uses photoelectric detectors in our giveaway program, has received bids for ions at about $6 and photos for around $8.)

Supporting Information

As the attached information will prove, the ionization detector may not go off until the smoke is so thick that egress is prevented. This may seem counterintuitive but it is the best explanation for the following statements.

<u>Statement One</u> - *We have measured the positive impact of smoke alarms in reducing fire deaths and multiple deaths in fires. We may not be able to save the person who fell asleep smoking, but we can save their family and neighbors by giving them an early warning of the danger.* (From foreword of MFIRS Report)

Comment on Statement One - Originally it was assumed that smoke detector should have the biggest impact on the types of fires that occur while people are sleeping, e.g. smoking-related fires. Now we find ourselves stating that they cannot save people involved with smoking fires. **Why, because the ionization detector, which over 90% of the population has, cannot reliably detect smoke from smoldering fires.**

<u>Statement Two -</u> *"In 39% of fire deaths, an alarm did operate – 10% points higher than in 1998 and 30% points higher than in 1988. This is somewhat disturbing since there is a widespread belief that an operating alarm will save lives. In some cases, the alarm may have gone off too late to help the victim, the victim may have been too inebriated or too feeble to react, or the fire may have.* (From "Fire in the US 2001", by the US Fire Admin.)

Comment on Statement Two - Actually a similar statement was made in the 2 previous editions of "Fire in the US". In those editions the USFA suggested, "further study be performed". To my knowledge the attached papers are the only study ever done to explain the increase. Logically this type of increase forces a researcher to ask, "what changed?" The most obvious answer is that in the mid 80's UL forced smoke detector manufacturers to make less sensitive detector in attempt to address nuisance alarms. Shortly after the modified the smoldering test in UL217 and UL268 to make it easier to pass**. As a consequence starting in the lat 80's we would have seen a gradual increase in the use of ionization detector that could not reliably detect smoldering smoke. This is exactly what happened.**

TABLE 12 – FIRES WITH WORKING DETECTORS
(DATA TAKEN FROM "FIRE IN THE US" REPORTS)

	% OF FATAL FIRES WITH WORKING DETECTORS	% OF HOMES WITH DETECTORS	% OF FIRES WITH WORKING DETECTORS
1988	9%	81%	38%
1990	19%	86%	42%
1994	19%	93%	49%
1996	21%	93%	52%
1998	29%	94%	55%
2001	39%	95%	55%

Statement Three – "The most important part of the smoking-material fire problem-the number of structure fires-has declined by two-thirds, or 66 percent, since 1980, while the number of civilian deaths has dropped by 49 percent from the high in 1981 and 44 percent since tracking began in 1980. However, deaths per 100 smoking-material fires were 66 percent higher in 1995 than they were in 1980." (NFPA – Smoking Material Fire Problem - 2004)

This second statistic is important since it allows one to isolate the items that would reduce fatalities due to preventing ignition from those that reduce deaths due to factors that affect outcomes once ignition occurs. It is self apparent that fire fatalities from cigarette ignites fires would be reduced over time due to a reduction in the number of smokers as well as regulations that would increase the number of mattresses and furniture resistant to cigarette ignition. If smoke detectors were also contributing to the reduction then there should be a reduction in the number of fatalities that are occurring after ignition occurs. The following two tables allow one to investigate this area of investigation.

TABLE 10 - FATALITIES AND INJURIES FROM CIGARETTE FIRES (5 YEAR ROLLING AVE/PER 100 FIRES) [31]

	1980-84	1984-88	1988-92	1992-96	1997-2001
Fatalities	3.0	3.5	3.6	3.7	3.5
Injuries	6.5	7.7	9.2	9.3	8.3

Evidently, smoke detectors have had virtually no impact on the number of fatalities from cigarette fires, once the fire was ignited**. In fact, the number of people being injured and killed in fires started by cigarettes was increasing at the same time that the number of installed smoke detectors was increasing dramatically. .** This seems counterintuitive unless one takes into account that at the same time that the amount of synthetic furniture was gradually increasing UL allowed slightly less sensitive ionization detectors to be introduced into the marketplace.

This result is only surprising if one is not familiar with the available research. Here are the results from recent testing conducted by the Federal Government. *(Cleary, T., "Test Methodology for Multiple Sensor: Multiple Criteria Alarms", International Conference on Automatic Fire Detection "AUBE '04", 13th Proceedings. University of Duisburg. [Internationale Konferenz uber Automatischen Brandentdeckung.] September 14-16, 2004, Duisburg, Germany, Luck, H.; Laws, P.; Willms, I., Editor(s)(s), 64-73 pp, 2004.)*

Note: keep in mind that 527CMR has a requirement that, *"Each smoke detector shall detect abnormal quantities of smoke that may occur in a building."*

FIGURE 1 - NIST RESULTS (TEST 34)

Smoldering Furniture in Living Room

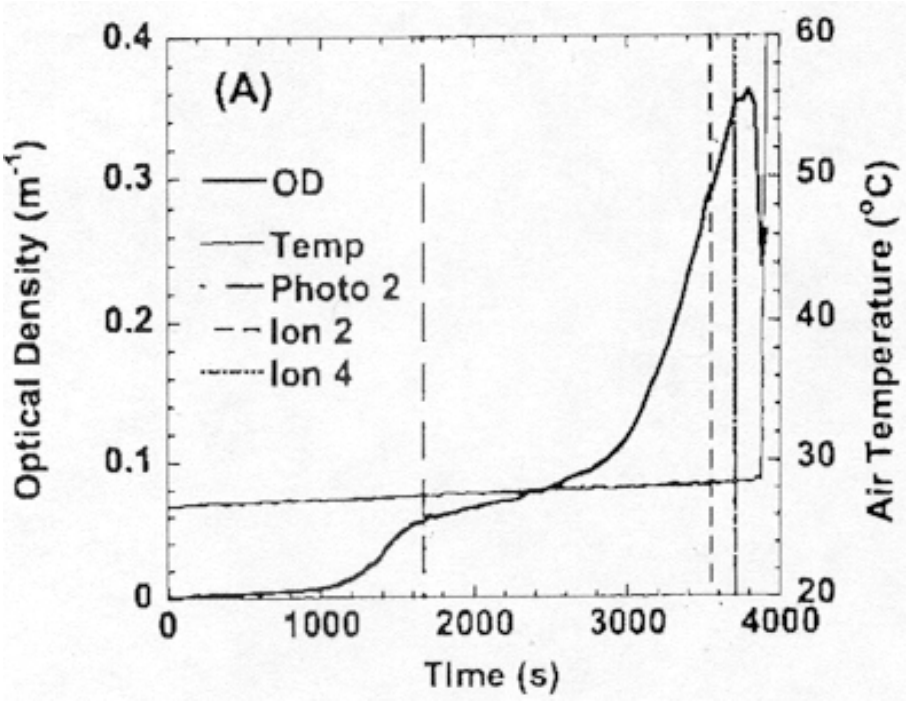

TABLE 3 – RESPONSE CHARACTERISTICS (TEST 34)

DETECTOR TYPE	RESPONSE TIME	OPTICAL DENSITY /METER	%OBSCURATION AT RESPONSE
Photoelectric	1600 secs	0.05 OD/m	3-4% obsc/ft
Ionization	3550 secs	0.28 OD/m	17-19% obsc/ft
Ionization	3700 secs	0.34 OD/m	20-22% obsc/ft

It is evident that the ionization detector is not responding until obscuration levels that far exceed the 10% obs/ft passing criteria in the UL 217 Smoldering Test. They are also not responding until after the 15% obsc/ft used by NIST as the thickness of smoke that prevents egress. (At this level of obscuration the smoke is so thick one cannot see across a 10-12 foot room.) Clearly the ionization smoke detector cannot " *detect abnormal quantities of smoke that may occur in a building*", as required by 527CMR.

Videos of this phenomeon can be viewed at **http://www.smokealarminfo.com/.**

Keep in mind that while some of these test might not be "scientific", the NIST's Tests, as well as the others cited in my paper were scientific and they got the same result. (NIST just isn't telling anyone.)

Finally I would like to comment on the following quote from a letter sent to me on January 19th, 2007, shortly after I testified before the Board.

"Thank you for your time researching and reviewing information on ionization and photoelectric smoke detectors and your presentation before the Board of Fire Prevention regulations. At this time, the Board of Fire Prevention regulations will continue to monitor this activity and will review their current statutory authority to determine if they can and should further regulate smoke detectors. We understand that you have approached the Board of building regulations and Standards regarding new construction and it is our understanding that the BBRS has taken action to require only photoelectric detectors in new construction.

At this time the Board has decided that you have contacted the appropriate government and listing agencies with the same research and information you provided to our office. We will continue to work with these same agencies and follow their further study and research. If you have any further questions please contact Timothee Rodrique, Director _ Office of the State Fire Marshal directly."

(From Stephen D. Coan, State Fire Marshal to Deputy Choieg Fleming, 01/19/07)

To assist the Board, let me address some of the issue raised in this letter.

Item One: *At this time, the Board of Fire Prevention Regulations will continue to monitor this activity and will review their current statutory authority to determine if they can and should further regulate smoke detectors.*

1) Does this mean that the Board discussed my information? If yes, could I have the minutes. I feel pretty confident that given the opportunity I can address any concerns that were raiseed. If my information was not discussed how was the dtermination made not to act upon it.
2) If the BBRS has the statutory authority why wouldn't the BFPR? In addition, Massachusetts was one of the first states to mandate smoke detector over heat detectors, based on evidence that smokes were better. Why is this issue any different?
3) If the Board did have information which indicated that ionization detectors were flawed don't they have a stautory obligation to take action to ptotect the citizen's of Massachusetts.
4) How does the Board intend to monitor this activity? Have they instructed local fire officials or the investigator at the Marshal's Office o check out this issue at the fires they respond to. (In the past I have made presentations to the Metro Chiefs, Mass Fire Prevention Association, and Arson seminras. I would be willing to do another similar to the one I recenbtly provided at the request of the Vermont State Fire Marshal.

Item Two: *We understand that you have approached the Board of building regulations and Standards regarding new construction and it is our understanding that the BBRS has taken action to require only photoelectric detectors in new construction.*

1) Actually I asked the BBRS to not allow "ionization only" detectors. In theory this would allow combination(ion/photo) detectors. As a practical matter, since the Mass Building Code restrict the use of ion

technology near kitchen's and bathrooms, a requirement that I authored back in the mid 90's, there will be many places that only photoelectric detectors would meet the code.

ItemThree: *At this time the Board has decided that you have contacted the appropriate government and listing agencies with the same research and information you provided to our office. We will continue to work with these same agencies and follow their further study and research.*

1) How is the Board curently working with federal and lisitng agencies? What further research is the Board talking about?
2) I would like to point out that I do not think we should wait for the Federal Government, UL, or the NFPA to take aggressive action. Inmy opinion certain institutional and Bureacratic tendencies create passivity on issue that are on the "cutting edge". In fact, It would appear that if I did not conduct my research independently of any federal effort neither the NIST Home Smoke Alarm Tests nor the recent research at UL would have been undertaken. (See letters from Jim Hoebel, CPSC retiree, and May 2005 Press Release from UL.)

The attached information contains more supporting data.

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Statement Of Problem and Substantiation Justifying Language in 527CMR, That Would Limit The Use Of Ionization Technology In Residential Occupancies (This is a modified version of material that has been presented to the NFPA.)

Presented To

Massachusetts Board of Fire Prevention Regulations

By

Joseph Fleming

Introduction

I would like to start by quoting the response of the NFPA Fire Alarm Committee (NFPA72) in response to my 1997 request to limit the use of ionization technology in residential occupancies.

> *"The committee feels that the data cited does not make a sufficiently compelling case for banning an entire technology. There would need to be clear evidence of a compelling hazard in order to justify a change that would deny ionization technology to consumers and to literally put companies out of business. A comprehensive testing project is being considered by the US Consumer Safety Product Commission (CPSC). If these tests indicate a compelling reason to ban ionization technology the committee will reconsider."*

Obviously, at the time the NFPA 72, National Fire Alarm Code, Committee felt that there was not a "compelling hazard." However, at that time, the number of people dying when the smoke detector worked had gone from 9% to 29 % in the previous 10 years (88-98). In addition the evidence I provided included the results of several test that indicated the ionization detector responded too late in smoldering fires. One of my concerns about the decision by the committee regarding how compelling the data is before making decisions is that it is essentially a "value judgment". I feel uncomfortable with representatives of manufacturers and consultants who depend on manufacturers for employment (the majority of the membership of NFPA 72), making value judgments about how compelling data has to be before it is allowed to impact on company profits. A mother, (or the members of the Board of Fie Prevention Regulations) whose primary responsibility is the safety of her children, (or the public) might feel that the data is compelling enough.

The type of evidence I submitted in 1997, which indicated the superiority of photoelectric technology over ionization technology, while still recognizing that ionization technology is better than nothing, is at least as compelling as the type of "compelling evidence" that the NFPA 72 committee used, in the late 70's, to justify denying heat detectors to the consumers and literally "put (heat detector) companies out of business," even though it was recognized that heat detector technology was better than nothing.

As indicated by the information that I submitted to the Committee in Orlando (01/06), I think the results of the NIST Testing, which the Committee said it would depend upon, as well as the new statistical evidence I have developed, represent an even more compelling case than existed in 1997, to ban ionization technology.

NIST Home Smoke Alarm Study

According to the NIST Press Release (February 24, 2004)

> *Smoke alarms are of two types—ionization and photoelectric. * Some combination models are sold. According to the two-year NIST home smoke alarm performance study,* ***ionization smoke alarms respond faster to flaming fires, while photoelectric smoke alarms respond quicker to smoldering fires. The report concluded that, despite these differences, the placement of either alarm type on every level of the house provided the necessary escape time for the different types of fires examined.*** *The researchers determined the necessary escape times by considering the time that the alarms sounded in various locations and the development of untenable (unsurvivable) conditions.*
>
> *To further investigate the results of an earlier study by the U.S. Consumer Product Safety Commission (CPSC), NIST also looked into "nuisance" or false alarms, usually activated by cooking fumes. Such false alarms are of concern because inconvenienced individuals sometimes disconnect the smoke detectors, leaving the area without devices capable of detecting authentic fires.* ***The NIST tests showed that normal cooking activities cause nuisance alarms in both photoelectric and ionization type alarms. Neither type of detector was demonstrably better in reducing nuisance alarms***

If either of the underlined statement were true it would be great. Unfortunately they are not.

Statement One - On pages 242 and 243 of the NIST Report (www.smokelarm.nist.gov), for smoldering fires in the living area, the ionization detector is providing negative (-43 & -54) or almost negative (+16) "Available Safe Egress Time". What makes this data so disturbing is that on page 66 of the NIST Report the smoldering fire in the living room is identified as the most common fatal scenario?

On page 240 NIST estimates daytime "required escape time" of <30 seconds & nighttime "required escape time" of 90-140 seconds. As a consequence, the fact that the ionization detector is providing a few extra seconds in flaming fires is not significant for life safety.

Statement Two – The only way this statement could be true is if one did not take into account how quickly the detectors responded and one also assumed that most kitchens have large fans built into the wall blowing the smoke away from the source. (As ridiculous as this sounds, these 2 assumptions appear to be used by NIST to support their methodology. Co-incidentally, both assumptions favor the ionization detector.) For the Toasting Scenario the ionization located near the kitchen responded in about 130-150

seconds. The photoelectric responded in 225-300. Since most toasters do not toast for more than 180 seconds it is unlikely that a photoelectric would respond. NIST apparently allowed the Toast to keep toasting until visible smoke appeared. "Photoelectric alarm thresholds were met only after item started to char and produce visible smoke." I would argue that when a toaster starts to produce visible smoke it is no longer a nuisance alarm. A review of all of the data in this section will produce similar results.

The failure of ionization detectors to adequately detect smoldering-initiated fires is clearly a "substantial hazard". Several researchers have identified the importance of smoldering-initiated fires. For example: "Delayed discovery, typically associated with fires that occur at night when everyone is asleep, also tends to be a characteristic of smoldering fires caused by discarded smoking materials. These smoldering fires are the leading cause of US fire fatalities and detectors are ideally designed to deal with them." (Hall, John, Fire Journal, (Sept/Oct, 1985).

Other Relevant Studies

Several other "published" residential smoke detector studies, in addition to the recent NIST Study, have concluded that ionization detectors were inadequate for smoldering scenarios.

- "The ionization detectors detected smoke from a smoldering fire much later than optical (photoelectric) detectors. When the particular conditions during the fire development are taken into consideration there are reasons to indicate that this detection principle would not provide adequate safety during this type of fire." (Meland, Oysten, and Lonuik, Lars, "Detection of Smoke - Full Scale Tests with Flaming and Smouldering Fires, "Fire Safety Science," - Proceedings of the Third International Symposium, July, 1991, pp. 975-984.
- Ionization detectors sited in the hallway generally provide inadequate escape times unless smoke movement into the hallway is slowed down by narrow door openings, causing a slower loss of visibility, or unless they are sited close to the smoke source. (Johnson, P., F., and Brown, S., K., "Smoke Detection of Smoldering Fires in a Typical Melbourne Dwelling," Fire Technology, Vol. 22, No. 4, November 1986, p.295.)
- "This test will show that most photoelectric detectors, operated by battery will detect smoke at about 1.5 - 3% smoke, which is good. The test will show that the photoelectric detectors operated by household current will activate between 2 and 4 %, which is still good. But, the test also will show that many ionization detectors will not activate until the smoke obscuration reaches 10-20 and sometimes 25%. … Therefore, because of the present state of the art in detecting smoke, the Subcommittee on Smoke Detectors can take no other course but to recommend the installation of photoelectric detectors." ("Residential Smoke Alarm Report - Prepared by Special Automatic Detection Committee of the International Association of Fire Chiefs," The International Fire Chief, (September 1980).)
- Ionization chamber type detectors, in the room of origin and the corridor, did not, in the smoldering fire tests, provide adequate warning that the escape route was impassable or that conditions in the room were potentially hazardous to life. (R., Riley, K., and Rogers, S., "A Study of the Operation and Effectiveness of

Fire Detectors Installed in the Bedrooms and Corridors of Residential Institutions", Fire Research Station, Fire Research Current Paper 26/78, Borehamwood, England, April 1978.*)*

No "published" study, that I have reviewed, has concluded that photoelectric detectors, with current "open" design, were inadequate for flaming or smoldering. This would appear to constitute "compelling evidence" that ionization detectors are not suitable for residential occupancies as stand alone devices, since a reasonable alternative is available. While it may be true that no single study is enough proof of this problem the totality of all of the studies provided considerable evidence that this problem is real.

Statistical Support

The evidence provided by these studies, along with the fact that majority of detectors in use are ionization, might help explain the following:

1. In 2001, 39% of the fatalities in residential occupancies occurred when the detector worked. (See Table 1.)
2. In 2001 the reduction in risk for those with detectors was only 24% & from 99-01 the reduction in risk in apartments and condos was only 7%.
   (1 & 2 are from NFPA Smoke Alarm Study, 11/04)
3. In analyzing Board & Care fires from 1971-1993, NIST concluded "appropriate detector systems was not critically associated with improvements to life safety", as there were slightly more incidents and deaths associated with 'appropriately implemented' detection system as there 'inappropriately implemented systems'". (NISTIR 5302, 11/93)
4. Smoke detectors should be "ideally designed" to reduce deaths from cigarette fires, since they providing warning to sleeping occupants. However this does not appear to be the case. The number of people dying per 100 cigarette fires actually increased from 1980 to 2001, even though we should have seen a massive reduction due to the fact that smoke detector usage went from 20% to over 90%. The bests explanation is that since the vast majority of detectors are ionization they are providing virtually no benefit in these types of smoldering started fires. ("The Smoking Material Fire Problem," National Fire Protection Association, Quincy, 11/04.)

In the late 80's only 10% of the fatalities in the home occurred when the smoke detector worked. It is currently over 30% and has been as high as 39% (A 300-400% increase.) Over that same time period the % of homes with detectors increased only 20%. This abnormally large increase in the number of fatalities occurring when the detector works, corresponded with the gradual introduction into the American home of the following: 1) less sensitive ionization detectors (in an attempt to address nuisance alarms) and 2) more synthetic furniture (which produces the kind of smoke that is difficult for the ionization detector to detect). Since this is the most likely cause for the increase it is not unreasonable to assume that delayed response of ionization detectors may be responsible for over 25% of the fatalities in the US (approximately 800 per year.) **The number of lives at stake makes it critical that this proposal not be forced to wait for the next code cycle.**

TABLE 1 – FIRES WITH WORKING DETECTORS
(FROM "FIRE IN THE US" REPORTS BY USFA)

	% OF FATAL FIRES WITH WORKING DETECTORS	% OF HOMES WITH DETECTORS	% OF FIRES WITH WORKING DETECTORS
1988	9%	81%	38%
1990	19%	86%	42%
1994	19%	93%	49%
1996	21%	93%	52%
1998	29%	94%	55%
2001	39%	95%	55%

When looking at item 2, the reduced risk provided by detectors, and considering the socio-economic factors that usually coincide with smoke detector ownership, the risk reduction due to the detector itself would seem to be even smaller. It seems clear that while ionization detectors are "better than nothing", they are not nearly as effective as they should be. For smoke detectors to achieve the potential that was envisioned in the late 70's and early 80's, they must provide adequate protection against smoldering fires as well as flaming fires. Only photoelectric technology accomplishes this goal.

Nuisance Alarms

An additional benefit of switching to photoelectric technology would be reduced response to nuisance alarms. Since approximately 20% of fire fatalities occur when the detector is disabled, switching to photoelectric technology could conservatively save ½ of this group (10%) or 300 people.

Two recent field studies support this position.

1) *"Ionization and Photoelectric smoke alarms in rural Alaskan Homes, Western Journal of Medicine, August 2000"*. In this study they found that at the end of 6 months 19% of the homes with ionization detectors had disabled the detector and over 80% of the time the reason was that "it goes off too much" with 93% of the false alarms related to cooking. Only 4% of the photoelectric detectors were disables and none of the reasons were related to nuisance alarms.
2) *"Smoke Detector Nuisance Alarms: a Field Study in a Native American Community", NFPA Fire Journal 1996; 90:65-72.* Of the 109 ionization detectors installed 49% had been disconnected over the previous year. None of the 3 photoelectric had experienced nuisance alarms. Here are a couple of quotes from this article.

> *"There were only three photoelectric detectors in our survey, none of which had nuisance alarms. One trailer had two of these detectors, each of which was paired with an ionization detector that was installed within 6 inches of it. Both of the ionization detectors sounded cooking nuisance alarms. In another home, the*

photoelectric detector was located 6 feet closer to the stove than an ionization detector, which had frequent alarms from cooking."

"... We favor photoelectric detectors to reduce rates of nuisance alarms from cooking and to provide optimal protection from cigarette related fires. Electrical detectors with battery back up are the detectors of choice, except in communities such as remote villages in Alaska, where alternating current is non-existent or unreliable. If ionization detectors are installed, they should be located at least 20 feet, and preferably 25 feet, from stoves and at least 10 feet from bathroom doors if possible."

Other Considerations

If the board does not agree, with my recommendation that photoelectric technology be mandated for all residential occupancies, they should at least consider my recommendation for residential occupancies with sprinklers, since the risk from flaming fire is essentially eliminated. In sprinkled occupancies the only hazard left is a smoldering fire. As a consequence the ionization detector provides no benefit.

Note: The following information contains my response to questions raised by the NFPA72 Committee. I think both the questions and the answers might prove interesting to the Board.

Response to Committee's Comments in Orlando

My papers on this topic contain far more information and have been previously supplied to the NFPA Committee in Orlando. Interestingly, although this information was supplied to the committee before the Orlando meeting no member raised any questions about any of the data in my papers. No one questioned my data showing that smoke detectors, i.e. ionization detectors, did not provide a risk reduction of 50%. No member questioned my data showing that smoke detectors, i.e. ionization smoke detectors, deserved only a small art of the credit for the reduction in fire fatalities. However, after the 10-minute presentation I was limited to in Orlando, 3 comments were made by committee members, Since I was not allowed to respond to these comments in Orlando, **I will now.**

RESPONSE TO 1st COMMITTEE COMMENT

1 member commented that the Oklahoma City Smoke Detector Give Away Program contradicted my testimony. I must assume the member assumes that since ionization detectors were used in the study and the risk was reduced then ion detectors are not flawed. If I had been allowed to respond, I would have pointed out that this study did not factor out other possible reasons for the decline and other studies have not been able to replicate the results.

For example, here is a quote from a British Study.(**DiGuiseppi C.**, et al , *" Incidence of Fires and Related Injuries After Giving Out Free Smoke Alarms,"* BMJ 2002;325:995.

"Giving smoke alarms away in an urban multiethnic deprived community did not reduce total or serious injuries from fires. Intervention and control households

had similar proportions of installed and working alarms after the distribution; few alarms had been installed or were maintained.

Our program mirrored the Oklahoma City programme. We distributed similar alarms to the same proportion of target households (27%) and installed a similar proportion (8% v 9% in Oklahoma City). In Oklahoma City, however, serious injuries declined by 80% in the intervention area while they increased 8% in the control area. In our study, serious injuries declined by only 13% in intervention wards, compared with a 50% decline in control wards. The confidence intervals of our rate ratios exclude all but a modest effect on total injuries and attended fires. While we cannot exclude a clinically important, beneficial effect on serious injuries, the absence of an increase in the prevalence of installed, working alarms suggests that the apparent lack of benefit in our population is real.

***The benefit in Oklahoma City may partially reflect regression to the mean, based on study design**; another likely explanation for the different results is that population differences affect the likelihood of alarms being installed and maintained. Recipients may have not understood installation instructions or brochures about the benefits of alarms because of illiteracy or poor command of English. Tenants may have lacked installation skills or tools or may have worried about landlords objecting to installation. Because of the small size of some flats, incorrect installation near sources of steam or cooking smoke may have increased false or nuisance alarms, leading to removal of the battery or disconnection. We attempted to tackle these barriers in our program, through use of foreign language brochures and local ethnic minority recruiters, offers of free installation, provision of pictorial information on installation, and postcards reminding recipients to change the battery. Nevertheless, few alarms were installed or working at follow up."*

Obviously the Oklahoma study did not isolate the benefit of the massive public education vs. the benefit of the detector. For example: the study noted that after a 3 month and a 12 month inspections, alarms were installed and function in only 50% of the homes. If that is true then how could detectors benefit the other 50%? Obviously other factors were contributing to the reduction. The Oklahoma Study does not prove that there isn't a problem with ionization detectors relative to photoelectric. It only means that a massive smoke detector give away program accompanied with a lot of public education and visits to peoples homes is a good thing that will reduce fire deaths.

RESPONSE TO 2nd COMMITTEE COMMENT

One member commented that it was inappropriate for me to use the California Chiefs Study since it was so "old". My first response is to point out tat this member did not mention the more recent studied that I also cite. But in any case there are other problems with the validity of this comment.

I find it interesting that this member as well as the NFPA 72 Committee as a whole had traditionally relied on studies from the 60's and 70's to support their position that both ion and photo technologies were adequate, Once I started to publish analyses that showed how these studies supported my position, supporters of ionization started to claim that these studies, which they had relied upon to justify rejecting my proposal in 1997, are now "too old". The problem with this claim is that it is never justified. (This lack of justification was true in Orlando.) I believe that my analysis which takes into account detector technology as well as material shows that since the detectors used in this study, as well as others that I cite, were essentially the same in terms of sensitivity as today's that the results are valid.

My latest paper, which I have provided to the committee, contains an analysis of every smoke detector study done in the last 30 years. The results of these tests clearly indicate the superiority of photoelectric technology.

Some committee members may be familiar with an article, which appeared in Fire Journal in September of 1993; Dick Bukowski, the chairman of the NFPA 72 Committee in 1997, published a "History of Detector Studies", which claimed the following.

> *"This article reviews ten independent studies conducted in four countries over a 20-year period in which 206 experiments were reported. All the studies were conducted to evaluate the performance of residential heat and smoke detectors in providing life safety for the occupants of residential fires."*
>
> *"All 206 experiments were real scale tests in houses or apartments and most of them used actual items - upholstered furniture mattresses etc - as the fire source. All the tests used standard heat and smoke detector installed in typical locations in the test houses. All the detectors were available for purchase at the time the tests were conducted, and all were calibrated at alarm levels of heat and smoke consistent with devices available in stores."*
>
> *"All the studies presented conclusions that were essentially identical, "When either ionization or photoelectric smoke detectors are located outside the bedrooms and on each level of a house, they provide adequate warning to allow the occupants to evacuate through their normal egress routes in most residential fire scenarios."*

There were several problems with Dick's analysis.

1) Although it was published in 09/93, an apparently arbitrary cut-off date of 06/91 was chosen. Unfortunately because Dick chose this cut-off date he did not include a study published in 07/91 by Norwegian Researcher's. If he had he would not have been able to claim that all studies show that the ion provides adequate protection.

Quotes From Norwegian Study

From Abstract: "During smoldering fires it is only the optical detectors that provide satisfactory safety. With flaming fires the ionization detectors react before the optical ones. If a fire were started by a cigarette, optical detectors are recommended. If not the response with these two types of detectors are so close that it is only in extreme cases that this difference between optical and ionization detectors would be critical in saving lives."

From Page 980: "The ionization detectors detected smoke from a smoldering fire much later than optical detectors. When the particular conditions during the fire development are taken into consideration there are reasons to indicate that this detection would not provide adequate safety during this type of fire. (Figure 5 (detector in room for smoldering fire) and Figure 6(detector in adjacent room for flaming fire)).

From Page 982: "In general the difference between the alarm times for the optical and the ionization detectors are reduced when detection is made from an adjacent room. This can be related to the fact that particles included in the smoke tend to coagulate." (This is illustrated by comparing Figure 7 (detector in room for flaming fire) and Figure 9 (detector in adjacent room for flaming fire).

"The ionization detectors detected smoke from a smoldering fire much later than the optical detectors. When the particular conditions during the fire development are taken into consideration there are reasons to indicate that this detection principle would not provide safety during this type of fire." (Page 980)

"In general (for flaming fires) the difference between the alarm times for the optical and the ionization detectors are reduced when detection is made from another room. This can be related to the fact that particles included in the smoke tend to coagulate (smoke aging)." (Page 982) Compare to my comments on the FM Hotel tests.)

For selective surveillance in homes, optical smoke detectors are generally the most safe. … For individual room surveillance, such as in hospitals and hotels, optical detectors should always be used. Even though these detectors are slightly less responsive when detecting smoke from flaming fires in a room, this time margin should be related to the greater safety that optical detectors provide when a smoldering fire occurs. The advantage of ionization smoke detectors during flaming fires is about a 15-20 second earlier warning. This margin will only be decisive for the loss of human life in extraordinary circumstances"

Another unfortunate oversight was that Dick elected not to discuss an Australian Study, which unlike the Norwegian Study was included in the references, because it only looked at smoke detectors and not heat detectors. (Why this invalidated the study escapes me.) Once again, if he had he would not have been able to claim that all studies show that the ion provides adequate protection.

Smoldering Dwelling Fires - Australia 1986 (Fire Technology 1986)

From Conclusions of Study:

- *Ionization detectors sited in the hallway generally provide in-adequate escape time unless smoke movement into the hallway is slowed down by narrow door openings, causing a slower loss of visibility, or unless they are sited close to the smoke source.*
- *An acceptable arrangement for protection against smoldering fires under the conditions investigated appears to be photoelectric smoke detectors located at each end* ***of the***

Another unfortunate oversight was that despite the comprehensiveness of NIST's Search for articles they overlooked several; that I was able to find. Once again, if they had been able to find these studies they would not have been able to claim that all studies show that the ion provides adequate protection. Here is one of those studies.

Study Of Fire Detectors In Bedrooms & Corridors (British Govt. 1979)

Conclusion (From Title Page): "The work has shown that ionization chamber type detectors in the room of origin or in the corridor do not necessarily provide adequate warning that the escape route is impassable, or that the conditions in the room of origin are hazardous to life. This observation stems from the apparent lack of sensitivity of ionization chamber detectors to smoke from smoldering bedding."

Quotes from Discussion (Page 11)

Smouldering Fire: "An interesting point to note is that, despite the fact that it did not operate in the very high concentration of smoke present immediately before the bed finally ignited, the ionization chamber detector in the main room (room of origin) operated positively and rapidly (within 15 secs) after the first appearance of flames."

From Conclusions

- *Under the conditions of ignition from flames, the ionization chamber type detector exhibited a greater sensitivity to the smoke produced than the photoelectric system. However, the rate of generation of smoke was so great that the extra time given by the ionization chamber as a result may be of little practical use.*
- *Ionization chamber type detectors, in the room of origin and the corridor, did not, in the smoldering fire tests, provide adequate warning that the escape route was impassable or that conditions in the room were potentially hazardous to life.*
- *Photoelectric detectors gave much earlier warning in the smoldering fire tests but those in the corridor did not guarantee sufficient warning of conditions in the room when the door was closed, but did warn of potential smoke logging of the corridor.*

In my opinion, the truth, although one would never be able to discern it from the NIST Review, is that every study for the past 30 years' that burned synthetic material and used detectors similar to today's' noticed that the ionization detector provided inadequate protection from smoldering fires. I would gladly analyze any studies that any members of NFPA 72 have that would contradict this statement. If no member were aware of any then what basis would exist for not limiting the use of ionization technology?

RESPONSE TO 3rd COMMITTEE COMMENT

In response to my remarks the Chairman commented that the recent NIST Study showed that fires were growing faster than they had in 1975, implying that this explained why more people were dying when the detector operated. There are 3 major problems with this thesis.

1) I have analyzed in depth the ignition methodology of both the original Indiana Dunes and the recent NIST Testing. I believe that a lot of the difference in times to untenability can be explained by different ignition methodologies.
2) My concern is with smoldering fires and according to NIST the smoldering fires are reaching amenability in approximately the same time.
3) The decrease in the time to untenability must be due to a change in materials. While it is true that there has been a substantial switch from natural to synthetic materials since Indiana Dunes most of that transition occurred before the late 80's and the rapid increase in the % of fatalities that occur when the smoke detector operates came since the late 80's.

Discussion of 1st Problem – Ignition Methodology

In the original Indiana Dunes test the flaming fires were started by ignited newspaper in a wastebasket that was adjacent to the furniture. This ignition method produced interesting results, which I will illustrate by looking at Test fire No. 63.

TEST NO. 63 INDIANA DUNES
(My comments are in bold type.)

Times	Fire Event
0 seconds	Ignition of newspaper
20 seconds	1 foot high flames from waste can
30-38 seconds	Ion detectors set at 0.61% obsc/ft respond. **These detectors are obviously responding to the newspaper fire not the furniture fire. In addition the sensitivity of the se detector is far higher than any ion used today. Did NIST take this into account?**
75 seconds	Slight smoldering from chair
155-183 seconds	Ion detectors set at1.18-1.23% obs/ft sensitivity respond. **These detectors are obviously responding to the newspaper fire not the furniture fire.**
240 seconds	6 inch high flames from wastebasket slight smoldering from chairs.
320 seconds	More newspaper added to wastebasket in order to ignite chair.
420 seconds	Slight smoke build-up in living room. Newspaper is producing a

	"clean burning smoke with little smoke. Ideally designed to "trip" an ionization detector.
435 seconds	Newspaper laid over arm of chair. **(This should actually be considered the ignition time for the chair.)**
465 seconds	1 foot high flames on right arm of chair
505 seconds	Bottom of chairs blows out
519-539	Ion detectors (1.35% obs/ft) on the same floor but remote from the room of origin respond outside room of origin
570 seconds	Flames along back side of chair.
533-587 seconds	All Photoelectric detectors in the room of origin and on the same floor but remote from the room of origin respond**. (Remember these detectors had a smoke entry problem that today's' photoelectric detectors do not.)**
630 seconds	Interior of chair exposed. Dense smoke build-up in living room from 5-foot level to ceiling. (Even though Researchers describe this as "dense" it must have been below what they consider tenability limits.)
720 seconds	2 ft high flames on chair. Smoke build-up is "very heavy". . (Even though Researchers describe this as "very heavy" it must have been below what they consider tenability limits.)
805 seconds	Tenability limit reached (Temp >150^{o}F) Obscuration tenability not exceeded at this time.)
810 seconds	Smoke very dense in living room, from 3 ft level to ceiling. Temp near ceiling equals 160^{o}F.

Points to Consider

- According to the researchers the time from ignition to untenability was 805 seconds. But time from ignition of chair to untenability was actually only 370 seconds. This scenario was typical for most of the flaming fire tests. This means that if one adjust the Indiana Dunes Ignition time to the time that the Chair was ignited the fires in 1975 were only growing 2 times faster than today's; not 5 times faster as stated by NIST. In addition, although not analyzed by NIST it is clearly implied that this increase in time to untenability is due to a change in materials from natural material to synthetic materials. However, while this is true it cannot be used by the Chairman to ignore my thesis. I will explain why in item problem #2.
- The advantage that the ionization detector has in flaming fires virtually disappear for detectors located outside the room of origin. This is due to smoke agglomeration. (This is critical since the vast majority of smoke detectors in the US are installed in hallways outside of rooms were fires start.

DETECTOR RESPONSE
IN/OUT OF ROOM OF ORIGIN IN TEST63

	Ion 0.61%	Ion 1.65%	Photo	Difference

Room of origin	30-38 seconds	155-183 seconds	533-587 seconds	Aprox 400 secs
Outside Rom of Origin	N/A	519-539 seconds	533-587 seconds	Approx. 15-50 secs

- NIST claims in the recent report that the detectors used in the 2 studies were the same.

> *"Calibration in the FE/DE of the alarms used in the current study showed that the sensitivity of the alarms as consistent with manufacturers ratings and, on average, of equivalent to those used in the 1975 study. The average sensitivity of all alarms tested (in the current study) was 1.5 +/- 0.4 % obsc./ft., in the 1975 study, the average of all alarms tested was 1.9+/- 0.7% obsc./ft. While the average for the 1975 tests is higher the uncertainty in the data overlaps."*

However, it seems inappropriate to average the sensitivity for all the detectors together. In Test 63 the average ionization detector sensitivity was approximately 1.1% obsc/ft. By averaging all detectors NIST present a misleading picture. For example; assume that in one test the average ion sensitivity was 1.0% obsc./ft., and the average sensitivity of the photos was 2.0% obsc./ft., the overall average would be 1.5% obsc./ft.. Now assume that in another test the average photo sensitivity could be 1.0% obsc./ft., and the average sensitivity of the ions could be 2.0% obsc./ft.. Once again, the overall average would be 1.5% obsc./ft.. As a consequence, from the first test to the second the sensitivity of the ionization would have double while the sensitivity of the photos decreased by a half. But the average would have stayed the same. By emphasizing the overall average sensitivity, this type of critical information is hidden.

During the testing at Indiana Dunes in 1975, some of the detectors used had a sensitivity as low as 0.61% obscuration. For some reason, that was never explained, in Phase Two of the testing, "a pre-set sensitivity of 1% per foot obscuration was requested from the manufacturers". This request is actually a bit troubling since 2% detectors were available to American Consumers. It is particularly troubling in light of one of the conclusion from Part One. [3]

> *"Whereas detectors set at nominal 2% per foot obscuration generally provided adequate warning, those detectors whose sensitivities were near 1% per foot (actual) provided a considerable increase in escape time for smoldering fires, the effect was much smaller for flaming fires.*[3]

If the researchers knew that 2% detectors were available to the public and the researchers knew that 2% detectors showed a considerable decrease in

response, relative to 1% detectors, to smoldering fires, why did they request only 1% detectors from the manufacturers in Phase Two?

Discussion of 2nd Problem – Faster Growing Fires

Some, such as the Chairman, appear to feel that the reason for the ion detector acceptable performance in the mid 70's while it is performing inadequately in the recent testing can be explained by looking at the NIST claim that the main difference in the amount of escape time in these modern test as opposed to the earlier test is due to:

1) Different, tenability criteria (It is implied that the tenability criteria in the most recent testing is more conservative.)
2) Fire growth rates are significantly faster.

Thus, it is important to analyze these two factors because both statements are extremely misleading.

TABLE 4 - FIRE GROWTH RATES (Page 248 of NIST Report)

	1975 TESTS[3, 4]	**CURRENT**[6]
Flaming	**1043 +/- 365 Seconds**	**169 +/- 37 Seconds**
Smoldering	**4146 +/- 1961 Seconds**	**3303 +/- 1512 Seconds**

While it is true that the fire growth rate for flaming fire is much faster than the 1975 test (A very misleading fact as I explain in my discussion of problem #1.), the growth rate for smoldering fire is not that much different. In fact, NIST states that, "Average times for smoldering fires in the current test series were comparable to those observed in the 1975 tests." (Page 249 of NIST Report.)

TABLE 5 - TENABILITY LIMITS (Page 248 of NIST Report)

	1975 TESTS[3, 4]	**CURRENT**[6]
Temperature	**>= 66°C**	**>= 88°C** ***(Less Conservative)***
Co Concentration	**>= .04%**	**>= .02-.03%** ***(More Conservative)***
Smoke Obsc. (OD/m)	**>= 0.23/m**	**>= 0.25/m** ***(The Same)***

Although the tenability criteria are different, it does not appears to explain the new result that the ionization detectors are inadequate for smoldering fires in the Living Room. In every smoldering case the tenability criteria that matters is obscuration. The obscuration tenability is virtually identical to the one used in 1975.

A better explanation for why the ionization detectors appear to be inadequate in these newer tests is the one hypothesized in the earlier paper[1].

> *"Ionization detectors may have been de-sensitized over time (definitely since the early 80's) and are relatively poor at detecting the kind of smoke given off by today's synthetic furnishings."* [1]

Discussion of 3rd Problem – Change in Material

At my request John Hall of the NFPA prepared the following table. As the data indicated, approximately 75% of the transition from natural to synthetic materials had occurred by the late 80's. Yet it wasn't until the late 80"s that the USFA started to notice an increase in fatalities when the detector operates occurred. As a consequence the change in effectiveness of the ionization detector cannot be due to a change in materials. Once again, a better explanation for why the ionization detectors appear to be inadequate in these newer tests is the one hypothesized in the earlier paper[1].

> *"Ionization detectors may have been de-sensitized over time (definitely since the early 80's) and are relatively poor at detecting the kind of smoke given off by today's synthetic furnishings."* [1]

CPSC data and estimates on cigarette resistance of U.S. upholstered furniture in use in homes (E-mail from John Hall- NFPA 6-7-06)

Year	Percent with cellulosic cover fabrics	Percent with non-smolder-resistant seat filling materials
1975	77%	28%
1976	75%	32%
1977	73%	37%
1978	70%	43%
1979	67%	48%
1980	64%	54%
1981	61%	59%
1982	59%	63%
Historic economic data above; projections shown below		
1983	56%	67%
1984	54%	71%
1985	52%	75%
1986	50%	78%
1987	48%	81%
1988	46%	84%
1989	44%	86%
1990	43%	88%
1991	42%	90%
1992	40%	92%
1993	39%	93%
1994	39%	94%
1995	38%	95%
1996	37%	96%

1997	37%	97%
1998	36%	97%

If I had been allowed to, I could have provided this information, as a response to the 3 comments, to the Committee when I was in Orlando. Given the hundreds of lives at stake, I think it would have been open-minded to do so.

SUMMARY

In reviewing my information and making a value judgment about the merits of my argument I would ask the Committee to keep in mind the following possible reasons why I appear to be alone, or at least almost alone, in advocating this position. (I do not think the reason is that my data or logic is not valid because I have yet to have anyone point out the flaws in my data or logic.) Keep in mind that I had to overcome many of these reasons myself during my many years of research. I wanted to believe that smoke detectors were an easy solution to the fire problem in the US. As a consequence, whenever the glass was half full I tended to overlook the fact that it was half empty. But over time the overwhelming evidence that there was a problem forced me to re-evaluate the evidence in a more objective manner. The glass was not only half empty it was actually three quarters empty.

The fact that the ionization detector is seriously flawed, for which evidence has existed for at least 25 years, has been overlooked by those responsible for identifying it and addressing it. There may be several reasons for this.

1. In thinking about problems people will often make logical errors:
    1. Select what they believe to be relevant information not all information.
    2. Consider the most plausible model rather than all possible models.
    3. Actively construct evidence that reflects their own views while failing to seek actively seek out counterexamples to tentative conclusions.
    4. When forced to choose between common sense and logical sense people often follow their instincts.

    (Bennet, D., *Logic Made Easy*, W W. Norton & Company 2004)

2. People may not want to acknowledge this fact for the following personal reasons:
    1. Some may not want the public to lose confidence in smoke detectors.
    2. Some may want to overlook evidence that disagrees with public positions they have taken in the past.

3. Some, e.g. manufacturers and consultants who work for manufacturers, will overlook evidence that create problems for their companies. (This is critical since the manufacturers and consultants make value judgments in their roles as members of standards and code committees.)

    Other researchers have cited this as a factor. In a Scientific American article titled "Doubt is Their Product"; David Michaels discusses the case of Vioxx and Merck.

"In early 2000, the results of a clinical trial showed that participants who took Vioxx for an average of 9 months had 5 times the risk of heart attack as those taking a comparison pain killer, naproxen (Aleve). Merck's scientists faced a dilemma. They could interpret the results as meaning that Vioxx increased the risk of heart attack by 400% or that naproxen reduced the risk by 80%. Unsurprisingly the company's researchers chose the latter interpretation. Eventually Vioxx was taken off of the market but not before 88,000 to 139,000 heart attacks, according to one FDA analysts.

Although the Wall Street Journal has reported that certain documents suggest that Merck executives were aware of the increased risk of heart attacks, it is heard to imagine that the company's scientists were deliberately promoting a drug they knew was unsafe. At the same time, it is hard to imagine they honestly thought naproxen reduced the risk of heart attack by 80%. If they did, they should have urged the government to pour it straight into the water supply. <u>It seems ore likely that their allegiances were so tightly linked with the products they worked on, as well as the financial health of their employers, that their judgment became fatally impaired."</u>

The title of the article derives from a tactic used by those who would forestall some new regulatory action often cite the need for more proof or raise some inconsequential issue about the evidence justifying another new regulation. *<u>"Doubt is our product since it is the best means of competing with the "body of fact" that exists in the minds of the general public</u>*." (From a memo written by a cigarette executive.) Because absolute certainty is rarely an option, regulatory programs would not be effective if such proof were required. In essence they always argue that the evidence is not compelling enough.

4. Certain "institutional/bureaucratic realities" add to the problem.
   - There are a variety of government, educational, and private organizations with a mandate to protect the public from harm. However, diffusion of responsibility often results in neglect of the harms caused by tech failures.
   - Information can be diffused and fragmented among various organizations. Limiting any one group's ability to see the "whole picture."
   - Commitment to a "course of action" may encourage highlighting info consistent with that "course of action" and ignoring info that is inconsistent with that "course of action". (In this case, getting smoke detectors into as many homes as possible as quickly as possible.)

   (Paraphrased from Minding the Machines, Evan & Manion, 2002)

If any member of the committee has any other comments or questions I would appreciate the opportunity to respond prior to the Committee voting on this issue. In addition, if the Committee decided to reject my proposal then I would ask the Committee to be specific with there reasons. Did the committee find factual errors in my data? Did the committee feel that we needed more information? Did the committee

feel that despite my information being correct they did not want to negatively impact the ionization manufacturers?

Finally, I know that there is a lot of information to review, but I believe the potential to save hundreds of lives per year justifies the effort. Since 1991, I have spent thousands of hours of my own time trying to finds ways to reduce the number of people dying due to nuisance alarm induced battery removal and reduce the number of people dying when the detector operates. I only ask that the committee members take a few hours to read the research papers I have written as a result of this effort.

Thanks.

SUPPLEMENTAL INFORMATION

Papers/Articles Authored by Jay Fleming

1. *Fleming, J.M., "Photoelectric v. Ionization Detectors - A Review of the Literature," Proceedings - Fire Suppression and detection Research Application Symposium, National Fire Protection Research Foundation, Orlando, Florida, February 1998.*
2. *Fleming, J.M., "Photoelectric v. Ionization Detectors - A Review of the Literature - Revisited," Proceedings - Fire Suppression and detection Research Application Symposium, National Fire Protection Research Foundation, Orlando, Florida, February 1998.*
3. *Fleming, J.M., "Smoke Detectors and the Investigation of Fatal Fires," Fire and Arson Investigator, International Association of Arson Investigators, Bridgeton, MO, May, 2000.*
4. *Fleming, J.M., "Comments on Smoke Detectors for Public/Private Fire Safety Council", Mailed to PPFC on May 10, 2005.*
5. *Fleming, J. M.. "Analysis of Fatal Fires in Massachusetts, 2002-2004" Presented to Massachusetts Board of Building Regulations and Standards, May 2005.*

Fatal Fires/Complaints To CPSC

1. *Rotterdam, New York*
   - *This complaint is based on a news report that told of a 7.5 million dollar award to a family because the ion detector operated too late. The really interesting thing about this fire is that apparently several hundred complaints had been filed with BRK that they never told anyone about.*

2. ***The NFPA 72 Committee should ask all members of the committee who represent smoke detector manufacturers, or trade organizations of that include smoke detector manufacturers,manufacturers to provide any complaints that the companies they represent, or companies that belong ot trade associations that they represnethey have received from consumers regarding smoke detectors. If any are provided they should be forwarded to the CPSC.***

   , *Ohio – 04/10/05 (3 fatalities)*
   - *3 students were killed at the University of Miami of Ohio. The cause appeared to be a cigarette on a couch and the detectors operated but not until the smoke prevented egress from the building.*
3. *Barre, Vermont - 12/17/05 (5 fatalities)*
   - *A mother and 4 children died in a fire I which a survivor was alerted by a detector but not before the amount of smoke prevented others from exiting safely.*
4. *New York, New York – 2/8/05 (2 fatalities)*
   - *A fire started by a cigarette on a couch did cause a smoke detector to operate, but not until the occupants path to the apartment door was blocked by fire and smoke. The mother died shielding her son in the bathtub. (I do not have the type of detector but it is most likely an ionization detector.*
5. *Mobile Home Complaint Regarding Nuisance Alarms.*
   - *This complaint had to do with the manufacturers failure to warn about the ionization detector propensity to experience false alarms.*

News Stories

Some Committee members implied that they would not be convinced unless I could produce actual fires were detectors operated but operated too late to allow for safe egress. While I believe that it is the NFPA's and USFA's responsibility to do this they obviously have no intention of investigating the matter. The failure to research this issue is interesting in light of this type of comment from the USFA. (Of course if someone is not objective regarding the effectiveness of smoke detectors why investigate?)

> *"Smoke detectors are much less likely to be present when there are fatalities. Detectors do indeed make a difference. Yet in 19% of the reported residential fire deaths in 1994, a detector did operate; in 1988, it was 9%. In some cases the detector may have gone off too late to help the victim, or the victim may have been too incapacitated to react. But the % of deaths with detectors, especially the upward trend, is somewhat disturbing since there is a widespread belief that an operating detector will save lives. Further study is needed to show what other factors were involved with these deaths." (Fire in the US 1998)*

Nevertheless, I have endeavored to look into it myself. I search the news almost every day for fires were the detector worked. Here are some that I will send to the Committee.

- Teaneck, NJ 03/05
- Seattle, WA 06-05
- Bend, Oregon 08/05
- Buffalo, NY 08/05
- Dayton, OH 08/05
- Fort Wayne, IN 10/05
- Frankfort, KY 10/05
- Largo, FL 10/05
- Huber Heights, OH 11/05
- Lisbon, NH 03/06
- Iron Mountain, MI 05/06
- Canton, OH 06/06
- Cedar Rapids, IA 06/06

Here are a couple of other stories that the Committee might appreciate.

- Elkoe Fire Dept. Story regarding failure of ion detectors to operate in thick smoke.
- Story from Columbus Ohio about the lack of effectiveness of smoke detectors.

Here are a couple of quotes from the Columbus Story. "In addition, being alerted by a smoke alarm didn't increase residents' chances of escaping death during blazes, the fire data show." .. "Marty Ahrens, manager of fireanalysis services for the National Fire Protection Association, added, "Smoke alarms don't provide any guarantees. <u>But you're much better off with them than without them."</u>

I agree that ion detectors are better than nothing but is that the standard that is not a standard the Board should use when setting minimum standards?

Information from Australia

Although I have met a lot of resistance in the US from the established standards groups, my concerns have met with much more objectivity in Australia. I am attaching a new position paper recently produced by the Australian Authorities. Here is a quote from an e-mail that discusses that position paper.

Joseph (Jay) Fleming has been instrumental in convincing Australian Authorities to move from recommending ionisation technology to photoelectric technology. His papers, which I have attached, are an incredible achievement and exemplary work. The papers are written in such a manner they simply cannot be refuted because they do not represent Jay's opinion; they represent a summary of the evidence world wide couched in words and manner that cannot be disputed. There are three papers. 'Photoelectric v Ionisation Detectors – A review of the literature' is his first paper, 'SMOKE DETECTORS TECHNOLOGY' is his second paper and was written for fire fighters to aid in fire investigation processes and his third paper is 'nfpa-final smoke revisited' is a further review. His papers were widely circulated by me amongst the authorities and Fire Industry people in Australia. Many were amazed at the content and the depth of the investigation by Joseph Fleming. Joseph never makes a claim that he cannot cross reference to other research and unlike other fire industry 'professionals' he does not reference his own work to prove a point in his own work. His work has been used by Fire Brigades and other authorities in Australia in their final conclusions and position statements. I have also attached a position statement published by the Australasian Fire Authorities Council (AFAC) who are a Federal body representing all emergency services and Fire Brigades in Australia and New Zealand. I know that Josephs Fleming's research was influential in the final AFAC outcomes. I highly recommend you contact him. I am sure you would have his contact details in your system, if not *come back to me and I will get them for you.*

I am a member of the Australian Standards committee FP-002 that is responsible for writing the Fire Detection and warning system standards. In Australia the fire detection Code AS 1670.1 mandates photoelectric detection for sleeping facilities in commercial buildings (hotels, motels, etc) and also any egress path in any building to which the Code applies mandates photoelectric detection and the Code for hospital patient care areas mandates photoelectric detection. However, in spite of the commercial Code and the fact that Fire Brigades were signatories to the code adoption we could not convince the Fire Brigades and other authorities that ionisation detection was entirely unsuitable for residential applications until now and Joseph Fleming was instrumental in that achievement.

(David Issac sent this e-mail to a Russ Ashe, a Fire Lieutenant in Barre Vermont. I was sent a copy.).

I am sure that there is no amount of evidence that will convince some Board members that I am right. But I have attempted to do all I can to provide the Board with a substantial amount of information. In my opinion it is far more information than the Committee has required before making many other decisions.